Wetland Mitigation Monitoring Report for the FAP 319 (US 36) site near East Hannibal, Pike County, Illinois (Fourth monitoring year--2002)

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Summary

Based on observations made during the 2002 season (fourth year of monitoring), the following is a summary that relates the likelihood that the compensation site will meet each goal within the five-year monitoring period. The goals, objectives, and performance standards follow those outlined in the IDOT monitoring request (25 March 1999).

Overall Project goal: To create 18.3 acres of forested palustrine wetland, enhance 5.0 acres of emergent wetlands, and preserve 12.6 acres of existing forested wetlands and 13.3 acres of upland buffer.

Hydrophytic vegetation, hydric soils, and wetland hydrology are currently present over the wetland creation site, which is somewhat smaller than the originally planned size, because of the necessity of placing non-wetland buffers between the excavated site and existing wetlands. Vegetation that colonized the created site is mostly dominated by native, aggressive species. Planted tree species appear to be doing well, and other woody species are colonizing the site. However, more tree planting will be necessary in order to meet the performance standard of 100 trees/acre. The original wet meadow on the site is becoming overgrown with woody species.

Introduction

This report describes the fourth year of monitoring of an excavated wetland created to mitigate for wetlands affected by the construction of the FAP 319 (US 36) bridge at Hannibal, Missouri. The wetlands affected were located on the Illinois side of the bridge. Earthwork for the mitigation site was completed in 1997; trees were planted in the fall of 1997. More trees were planted in 1998 to replace planted trees that had died (pers. comm. from Mike Vanderhoff of the IDOT to Allen Plocher 1999). We observed that more tree seedlings were planted late in 1999 or early in 2000 to replace lost individuals.

This report discusses the goals, objectives, and performance criteria for the mitigation project, the methods used for monitoring the site, monitoring results, and discussion and recommendations. Methods and results are discussed for performance criteria for each goal.

Vegetation monitoring was previously conducted on a pre-existing wetland area within the mitigation site (Plocher and Tessene 1995, 1997; Tessene *et al.* 2000, 2001, 2002). Results of these surveys will be discussed.

Goals, Objectives, and Performance Criteria

The goals, objectives, and performance criteria described below follow those listed in the request to monitor the site (Tom Brooks, IDOT, 25 March 1999). Each goal should be attained by the end of a five-year monitoring period.

Project Goal 1: The created wetland community should be a jurisdictional wetland as defined by current federal standards.

Objective: The created wetland will be formed through excavation in an 18.3-acre former crop field.

Performance criteria:

a. Predominance of hydrophytic vegetation: More than 50% of the dominant plant species must be hydrophytic.

b. Presence of hydric soils: Hydric soil characteristics should be present, or conditions favorable for hydric soil formation should persist at the site.

c. Presence of wetland hydrology: The area must be either permanently or periodically inundated at average depths less than 2 m (6.6 ft), or be saturated to the surface, for at least 12.5% of the growing season.

Project Goal 2: The created wetland community should meet standards for floristic composition and vegetation cover.

Objective: A floodplain forest will be created by planting native woody species. Herbaceous vegetation will be allowed to colonize the site naturally.

Performance criteria:

a. Planted species survivorship: At the end of the five-year monitoring period, at least 100 planted trees per acre will be present and healthy in the created wetland site.

b. Native species abundance and cover: At the end of the five-year monitoring period, at least 75% of the area in the created wetland should be covered by persistent hydrophytic vegetation. In the first year, percent coverage should be at least 15%. Native plants should be at least 50% of total species at the end of five years, at least 10% in the first year.

c. Dominant plant species: None of the three most dominant plant species in the planned wetland should be non-native species.

Project Goal 3: The previously existing wet meadow community will continue to be monitored.

Objective: A wet meadow community will be maintained through periodic prescribed fire.

Performance criteria:

Native species abundance and cover: Native perennial, non-woody species will continue to be the predominant species.

Methods

Project Goal 1

a) Predominance of hydrophytic vegetation

The method for determining dominant hydrophytic vegetation at a wetland site is described in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987), based on areal coverage estimates for individual plant species. Each of the dominant plant species is assigned its wetland indicator rating (Reed 1988). A plant species that is rated facultative or wetter (FAC, FAC+, FACW, or OBL) is considered to be hydrophytic. If more than 50% of the dominant species present are hydrophytic, this criterion of wetlands is met.

b) Occurrence of hydric soils

To monitor hydric soil development, the soil will be sampled each year. Soil profile morphology, including horizon color, texture, and structure are analyzed at representative points throughout the site. Additionally, the presence, type, size, and abundance of redoximorphic features are recorded. In the absence of hydric soil indicators, hydrologic data can be used to confirm that conditions favorable for hydric soil formation persist at the site (Environmental Laboratory 1987).

c) Presence of wetland hydrology

Indicators of wetland hydrology include, but are not limited to, drift lines, wetland drainage patterns, sediment deposits on leaves, watermarks on trees, and visual observation of inundated or saturated soils (Environmental Laboratory 1987). Personnel from the Illinois State Geological Survey (ISGS) installed stage gages and monitoring wells in order to monitor the hydrology of the site. Monitoring well data from the ISGS (Watson and Pociask 2002) were used to determine the seasonal depth to the water table and the area of the site that meets the wetland hydrology criterion.

Project Goal 2

a) Planted species survivorship

In 1997 and 1998, 1951 saplings were planted on the site (Mike Vanderhoff, IDOT, pers. comm. to Allen Plocher, 1999). In 1999, the plantings were sampled rather than totally enumerated in the interest of time constraints. For each 1000 feet of a planted row of trees, 200 feet were sampled (20% sample), with each planted sapling assigned to species and noted if living or dead. Assuming that trees were planted regularly throughout the site, as was indicated, this method would provide a representation of the survival rate of each species.

Our observations during the 2000 survey suggested that more tree seedlings were planted to replace dead individuals. Thus, a total count of planted tree species was conducted to determine the total number of individuals. Because more seedlings were planted, direct comparisons between the 1999 and 2000 results cannot be made. Total counts of planted tree species were again attempted in 2001 and 2002.

b) Native species abundance and cover, and

c) Dominant plant species

A complete vegetation survey of the excavated wetland basin was performed to tally all naturally occurring plant species present. Vegetation was also sampled in the wetland basin by placing 0.5 m^2 quadrats along four transects perpendicular to the access road. Two transects were placed on either side of the existing wetland site at approximately 20 m intervals. Quadrats were placed at 20 m intervals along each transect, for a total of 47 plots. Cover of each species

encountered in each plot was assigned a cover class (modified from Daubenmire 1959) (Table 1). Frequency (proportion of quadrats where a species occurred) and average cover (from midpoints for each cover class) were used to compute relative frequency (frequency of a species relative to total observations) and relative cover (or dominance)(cover relative to total observed cover). These two values were averaged to determine the importance value for each species sampled. Dominant species were determined by adding the importance values, listed in descending order. Those species that immediately exceed 50% of importance value, plus any additional species with an importance value of 20% or greater, are considered dominant species.

Table 1. Cover classes used in vegetation sampling.

Cover Class	Range of Cover (%)	Midpoint of Range (%)
1	1-5	3.0
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

Included with the assessment of a site is the site's Floristic Quality Index, as described by Swink and Wilhelm (1994) and Taft *et al.* (1997). Although the Index is not a substitute for quantitative vegetation analysis in assessing plant communities, it provides a measure of the floristic integrity or level of disturbance of a site. Each plant species native to Illinois is assigned a rating between 0 and 10 (the Coefficient of Conservatism) that is a subjective indicator of how likely a plant may be found on an undisturbed site in a natural plant community. A plant species that has a low Coefficient of Conservatism (c) tends to be common and is likely to tolerate disturbed conditions; a species with a high c is relatively rare and is likely to require specific, undisturbed habitats. Species not native to Illinois are not rated.

To calculate the Floristic Quality Index (FQI), first compute the mean c value ($\bar{c}$), $\bar{c} = (\Sigma C)/N$, where ΣC represents the sum of the numerical ratings (c) for all species native to Illinois recorded for a site, and N represents the number of native species on the site. The c value for each species is shown in the species list for the site. The FQI of each site is determined by multiplying the mean c value by the square root of N ($\bar{c}\ \sqrt{N}$)(equivalent to $\Sigma C/\sqrt{N}$). An Index score below 10 suggests a site of low natural quality; below 5, a highly disturbed site. An FQI value of at least 20 ($\bar{c}$ above 3.0) suggests that a site has evidence of native character and may be considered an environmental asset.

Project Goal 3

Vegetation in the pre-existing wet meadow was sampled in 1994 and 1996 (Plocher and Tessene 1995, 1997). This sampling compared vegetation before and after a prescribed burn in the spring of 1996. (No other prescribed burns are known to have been attempted at the site.) Vegetation sampling conducted during the monitoring of the wetland creation site in 1999 and 2000 followed the same methods. In the 2001 and 2002 surveys of the site, systematic sampling was not conducted in the pre-existing wetland. Herbaceous vegetation closely resembled that of previous surveys at first glance, and the continued vigorous growth of woody vegetation showed that the goal of maintaining a wet meadow may prove elusive in the long term.

Results and discussion

Project goal 1

a) Predominance of hydrophytic vegetation

Dominant plant species for the created wetland are listed in Table 2. All of the dominant species are hydrophytic. Species encountered during vegetation sampling at the site, used to determine the dominant species, are listed in Table 5. A full list of plant species observed is presented in the wetland determination form at the end of this report (Appendix 1).

Table 2. Dominant plant species by stratum and wetland indicator status.

Dominant Plant Species	Indicator Status	Stratum
1. *Aster simplex*	FACW	herb
2. *Bidens frondosa*	FACW	herb
3. *Typha latifolia*	OBL	herb
4. *Echinochloa muricata*	OBL	herb

The herbaceous species that colonized the site continue to be dominated by taxa that tolerate or thrive under disturbed conditions, such as the original site excavation, occasional mowing, and periodic, prolonged inundation. *Echinochloa* remains a dominant, as it was in each previous survey, but remains relatively less abundant than in 2000 (see Table 5). *Aster* and *Typha* are rhizomatous perennials and are likely to increase. *Bidens* and *Echinochloa* are annuals that can grow quickly and compete well where the mowed areas lessen competition from perennial species.

b) Presence of hydric soils

This site has been excavated. Soils mapped at the site include Fluvaquentic Hapludolls which are somewhat poorly drained (Shaffton and Coffeen series) and Fluvaquentic Endoaquolls which are poorly drained (Ambraw and Beaucoup series)(Struben and Lily 1999). Soils at the site were most similar to the Ambraw series, assuming the mollic epipedon had been removed during excavation. Soils in the Ambraw series are commonly found in this part of the Mississippi River floodplain. They consist of very deep soils formed in stratified loamy alluvium.

Soil cores were examined from several different areas at the site. A typical pedon is described below. Soils in those areas that are not mowed are starting to develop a thin organic layer at the surface. Redoximorphic features began within 0.08 m (3 in) from the soil surface and were distinct throughout the profile. Iron-manganese concretions were also observed. The depth to saturation was not observed at the time of visit, but there was still evidence of episaturation. The site hydrology and morphological characteristics of these soils suggest that they are saturated long enough for anaerobic conditions to occur in the upper profile for a significant duration. Therefore, these soils are hydric.

Table 3. Description of the soils for the majority of the site

Depth(in)	Matrix Color	Concentrations	Depletions	Texture	Structure
0 – 10	2.5Y 3/1	10YR 3/3	none	Loam	Granular to Sub-blocky
10 - 24	2.5Y 3/1	7.5YR 3/4 &10YR 3/3	10YR 5/1	Sand	Single Grain

c) Presence of wetland hydrology

Field evidence of wetland hydrology included the excavated depressional landscape position, water-borne sediment deposits, and stranded algal mats. Wetland hydrology on the site does not derive directly from river flooding, since the site is behind a levee, but from a rise in local water tables.

Well data from instruments placed by ISGS personnel suggest that the total area of the created wetland that conclusively meets the wetland hydrology criterion is 7.0 ha (17.4 acres), effectively the entire excavated basin (Watson and Pociask 2002)(Appendix 3). This compares with 6.7 ha (16.5 acres) in 1999 (Fucciolo *et al.* 1999), 6.5 ha (16.0 acres) in 2000 (Watson and Pociask 2000), and 7.0 ha (17.4 acres) in 2001 (Watson and Pociask 2001).

Project Goal 2

a) Survival of planted trees

According to Mike Vanderhoff of the Illinois Department of Transportation (pers. comm. to Allen Plocher, 1999), 1636 trees (409 each of four different species) were originally planted on the 18.3 acre former crop field in the fall of 1997, after earth work was completed for the wetland compensation site. In the fall of 1998, 654 trees were planted to replace those that had died, in the original 20' by 20' spacing. Then, in order to avoid ponded areas on the site, the remaining 315 trees were planted between existing live stems, resulting in 10-foot spacing in some rows. As a result, the total number of live planted saplings on the planned wetland site was 1951 in the fall of 1998.

When we began to assess the planted trees during the 2000 survey, we observed that new individuals had been planted to replace those that had died. This was especially apparent with the large number of pecan seedlings that we observed. However, we were not certain how many were planted. Thus, a total count of live and dead trees was made, instead of the sampling of 20% of total row length that was conducted in 1999. A total count was also attempted in 2001 and 2002. Mowing between the rows of planted trees aided the counts (although a few trees were mowed down in the process). Site conditions allowed the mowers to work even in the dense cattail patches in lowest elevation areas on the site in 2002.

Table 4 presents data for planted tree survival, with numbers of observed live stems. Density of live stems of each species is also listed. Results from the counts in other years are provided for comparison (Table 4a).

Table 4. Observed survival of planted trees in 2002 at East Hannibal wetland mitigation site.

Species	Live stems Observed	Density live/acre (live/ha)
Carya illinoensis	297	16.50 (40.75)
Fraxinus pennsylvanica	479	26.61 (65.73)
Quercus bicolor	411	22.83 (56.40)
Quercus palustris	302	16.78 (41.44)
Total	1486	82.56 (203.91)

Table 4a. Observed survival of planted trees in previous years at East Hannibal wetland mitigation site.

Species	Live stems observed each year			
	1999 (estimated)	2000	2001	2002
Carya illinoensis	135	310	264	297
Fraxinus pennsylvanica	450	503	460	479
Quercus bicolor	230	439	413	411
Quercus palustris	220	332	298	302
Prunus sp.	0	5	0	0
Total	1035	1589	1435	1486
Approx. #/acre	56.56	88.56	79.72	82.56

The 2002 tree counts are about the same as those for 2001, but are somewhat greater for *Carya* and *Fraxinus*. The former species may be more noticeable than in the two previous years, because the seedlings are starting to grow taller now that they are better established. The pecans planted were much smaller than the other planting stock, and some may have been overlooked previously. Some of the ash saplings recorded may have been naturally established from the surrounding forests instead of from planted stock. This species is doing well on the site.

From the above tables, one can note that numbers of individuals of all species increased between 1999 and 2000, because more trees had been planted. *Fraxinus* remains the most common species in all surveys.

A small number of planted specimens, observed in 2000, that appeared to be individuals of the genus *Prunus*, did not survive under the site conditions. Members of this genus are generally not found in wetlands.

In any case, the number of planted tree stems on the site does not meet performance standards, which state that 100 healthy stems per acre is necessary. Thus, more woody stems may need to be planted. On the other hand, other woody species are colonizing the site, and some will become trees. *Acer saccharinum, Betula nigra, Diospyros virginiana, Populus deltoides, Salix exigua, Salix nigra,* and *Ulmus americana* stems, as well as unplanted *Fraxinus pennsylvanica* and *Quercus palustris*, were all recorded from the excavated wetland site. Woody plants will certainly continue to invade the site from surrounding forests. Therefore, the site will eventually become floodplain forest, interspersed with patches of marsh where cattails and other herbaceous species dominate (in the wettest parts of the wetland creation site).

b) Abundance and cover of native species

Table 5 below presents the results of vegetation sampling in the created wetland site. We noted 38 species, 34 of which are native to Illinois, in the 47 quadrats. (Strangely, 38 species were also sampled in both the 2000 and 2001.) Thus, about 89.5% of the species sampled and 98% of the importance value in the plots is contributed by native species. In 2001, 33 of the 38 species were native, and 28 of 38 in 2000 were native. The dominant species are all native hydrophytes.

Table 5. Results of vegetation sampling at the East Hannibal created wetland basin in 2002.

Species	Frequency (%)	Relative Freq. (%)	Average Cover (%)	Relative Cover (%)	Importance Value
Aster simplex	70.21	13.58	33.53	24.71	19.14
Bidens frondosa	63.83	12.35	16.95	12.49	12.42
Typha latifolia	46.81	9.05	17.93	13.21	11.13
Echinochloa muricata	42.55	8.23	9.06	6.68	7.45
Solidago canadensis	25.53	4.94	9.84	7.25	6.09
Cyperus esculentus	29.79	5.76	5.16	3.80	4.78
Rumex crispus	29.79	5.76	4.20	3.10	4.43
Cassia fasciculata	19.15	3.70	5.06	3.73	3.72
Aster pilosus	19.15	3.70	3.60	2.65	3.18
Aster praealtus	14.89	2.88	4.68	3.45	3.16
Eleocharis obtusa	12.77	2.47	4.89	3.61	3.04
Carex vulpinoidea	19.15	3.70	3.09	2.27	2.99
Asclepias incarnata	12.77	2.47	1.63	1.20	1.83
Eupatorium serotinum	10.64	2.06	1.34	0.99	1.52
Eleocharis compressa	8.51	1.65	1.76	1.29	1.47
Leersia oryzoides	4.26	0.82	2.61	1.92	1.37
Eleocharis erythropoda	6.38	1.23	1.44	1.06	1.15
Campsis radicans	6.38	1.23	1.18	0.87	1.05
Polygonum hydropiper	6.38	1.23	1.18	0.87	1.05
Pyrrhopappus carolinianus	8.51	1.65	0.51	0.38	1.01
Vitis riparia	8.51	1.65	0.26	0.19	0.92
Fraxinus pennsylvanica	6.38	1.23	0.45	0.33	0.78
Salix exigua	2.13	0.41	1.33	0.98	0.70
Acer saccharinum	4.26	0.82	0.64	0.47	0.65
Sagittaria latifolia	4.26	0.82	0.64	0.47	0.65
Bidens tripartita	4.26	0.82	0.38	0.28	0.55
Mentha arvensis	2.13	0.41	0.80	0.59	0.50
Bidens cernua	4.26	0.82	0.13	0.09	0.46
Poa pratensis	4.26	0.82	0.13	0.09	0.46
Juncus tenuis	2.13	0.41	0.32	0.24	0.32
Setaria glauca	2.13	0.41	0.32	0.24	0.32
Trifolium repens	2.13	0.41	0.32	0.24	0.32
Amaranthus tuberculatus	2.13	0.41	0.06	0.05	0.23
Apocynum sibiricum	2.13	0.41	0.06	0.05	0.23
Cornus drummondii	2.13	0.41	0.06	0.05	0.23
Erigeron annuus	2.13	0.41	0.06	0.05	0.23
Lindernia dubia	2.13	0.41	0.06	0.05	0.23
Rorippa islandica	2.13	0.41	0.06	0.05	0.23
Total	517.02	100.00	135.71	100.00	100.00

About 82% of species and 85% of importance value is supplied by hydrophytes, compared with 74% and 80%, respectively, in 2000, and 82% and 87% in 2001. Thus, this seems stable. Annual species comprise 32% of species and 30% of importance value, quite a reduction from 50% of species and 80% of importance value in 2000, and 47% and 44%, respectively, in 2001. This suggests that site conditions are becoming stabilized and persistent hydrophytic vegetation is dominant. This is true even in the sample areas between tree planting rows that are mowed occasionally. Thus, the site is well on its way toward meeting the original project goals that 75% of the site be covered by persistent hydrophytic vegetation, and at least 50% cover by native species.

During a survey of naturally occurring plant species on the wetland creation site, 111 native and 23 non-native species were observed (see Appendix 1). A strong majority of the species observed includes perennials, hydrophytes, and plants that are native to Illinois. The FQI value for the site (unplanted species) was 29.0 with a mean C value of 2.8, indicating good natural quality and the potential to become an environmental asset. Including the planted saplings, the FQI value was 30.0 with a mean C value of 2.8. Table 6 below compares the 2002 values with those found from plant species surveys of the created wetland basin from 1999 through 2001 (Tessene *et al.* 2000, 2001, 2002). General trends suggest an increasing number of naturally occurring plant species on the site, with an increase in the proportion of perennial species as the site develops.

Table 6. Development of some aspects of the plant community in the created wetland basin.

Aspect	1999 value	2000 value	2001 value	2002 value
Species	57	84	109	134
Native species	45 (78.9%)	69 (82.1%)	93 (85.3%)	111 (82.8%)
Non-native spp.	12 (21.1%)	15 (17.9%)	16 (14.7%)	23 (17.2%)
Annual species	28 (49.1%)	36 (42.9%)	39 (35.8%)	41 (30.6%)
Perennial species	29 (49.9%)	48 (57.1%)	70 (64.2%)	93 (69.4%)
Woody species*	6 (10.5%)	11 (13.1%)	17 (15.6%)	21 (15.7%)
Hydrophytes	43 (75.4%)	65 (77.4%)	86 (78.9%)	101 (75.4%)
Non-hydrophytes	14 (24.6%)	19 (22.6%)	23 (21.1%)	33 (24.6%)
FQI**	14.6	17.8	24.5	29.0
Mean c value	2.2	2.1	2.5	2.8

* shrubs and woody vines
** FQI for non-planted species

c) Dominant plant species

The herbaceous species that colonized the site are dominated by taxa that can tolerate or even thrive under disturbed conditions, such as the original site excavation and periodic, prolonged inundation. *Echinochloa* remains a dominant species, as it was in 1999, 2000, and 2001, though with a diminished importance value, as perennial species increase in number and importance. Bidens frondosa, another annual, became more important in 2002. *Aster simplex* and *Typha latifolia*, the other dominants, are widespread, perennial, rhizomatous species. *Setaria*, a non-native annual species that was among the dominants in 2000, is becoming less important on the site.

Cattails appeared to increase noticeably on the site between 2000 and 2001. Locally, this species can form monotypic stands in the wettest parts of the site. Paths mown between the rows of planted trees may help check the growth of cattails, and diminish their ability to compete with the saplings. In the long run, the trees should be able to shade out the cattails, except in the wettest areas. If trends continue, the site will become a complex of marsh and floodplain forest, rather than merely floodplain forest.

Project Goal 3

A list of all species observed in the wet meadow is presented in Appendix 2. These remain unchanged from observations in 2000 and 2001. Quantitative vegetation sampling was not performed in 2001 or 2002. Overall, the original wet meadow site seemed similar to previous years, although woody growth continues encroaching on the fringes of the site.

Observations are comparable with previous sampling by Plocher and Tessene (1995, 1997), Tessene *et al.* (2000, 2001), and the original wetland determinations by Keene and Tessene in 1992, which showed the same three species (*Leersia oryzoides, Aster simplex, Apocynum sibiricum*) as dominants.

An original goal of this wetland mitigation project was that this pre-existing wet meadow persist, and that woody growth be kept in check by controlled fire. This goal is not being met, but given the vigorous growth of *Fraxinus, Populus, Salix,* and other woody species on the site, a burn may not be enough to slow their growth and eventual dominance of the site. The one prescribed burn on the site (Plocher and Tessene 1997) did not seem to slow the establishment of woody growth. Alterations of site hydrology when the adjacent wetland basin was created, and the cessation of agricultural use of the site may have contributed to the diminishing of the wet meadow; the abundant sources of propagules nearby certainly contributed. Cutting, along with herbicide application to the cut stumps, may be necessary to control woody species, if this remains a project goal.

Recommendations

The excavated portion of the wetland creation site has developed into a wetland, given that dominant hydrophytic vegetation, hydric soils, and wetland hydrology are present throughout the excavation. However, it appears that the whole former field was 7.4 ha (18.3 acres), and that the excavated basin was 7.0 ha (17.4 acres) (Fucciolo *et al.* 1999). Thus, not all of the 7.4 ha (18.3 acre) site can be called jurisdictional wetland, as is called for in the mitigation plan. Given the nature of the site, there is not room to increase the basin.

In order to achieve the desired 100 live trees per acre called for in the initial mitigation site plan, planting rates will need to be increased to allow for inevitable losses. On the other hand, natural colonization by woody species present in the surrounding wetlands is increasing, and may make up for some of the loss.

Unplanted herbaceous species in the created wetland basin are somewhat weedy species that tolerate disturbance, as one might expect on a recently created site. Dominant species are native hydrophytes, following project goals, and perennial species provide a majority of species present as well as a majority of the cover.

Typha may come to pose a threat to a diverse herbaceous cover on the site, for it generally forms dense patches where found on the site. Further monitoring is necessary, and some type of control may be needed in the future. *Phalaris*, another potential threat (since it occurs in the wet meadow and also along the slough near the road) (Keene and Tessene 1992, and personal observations), has apparently not emerged as such at this time.

The wet meadow (originally present on the site before the wetland basin was created) is becoming overgrown by woody vegetation, a natural process, but one that goes against project goals. Several controlled burns, and the cutting of woody stems along with herbicide treatment of cut stumps may be necessary if this goal is still desired.

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Appendix 1
ROUTINE ONSITE WETLAND DETERMINATION
Site 1 (page 1 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist — Date: 31 July 2002
Job No.: P96-037-73 — Project Name: FAP 319 (US 36)
State: Illinois — County: Pike — Applicant: IDOT District 6
Site name: Marsh
Legal Description: NE/4, Sec. 17, T.4S., R.8W.
Location: Excavated part of wetland restoration/creation site at East Hannibal

Do normal environmental conditions exist at this site? Yes: X No:
Has the vegetation, soils, or hydrology been significantly disturbed? Yes: No: X

VEGETATION

Dominant Plant Species	Indicator Status	Stratum
1. *Aster simplex*	FACW	herb
2. *Bidens frondosa*	FACW	herb
3. *Typha latifolia*	OBL	herb
4. *Echinochloa muricata*	OBL	herb

Percentage of dominant species that are OBL, FACW, FAC+, or FAC: 100%
Hydrophytic vegetation: Yes: X No:
Rationale: More than 50% of the dominants are OBL, FACW, FAC+, or FAC.

SOILS
Series and phase: Ambraw silt loam (Fluvaquentic Endoaquoll)
On Pike County hydric soils list? Yes: X No:
Is the soil a histosol? Yes: No: X Histic epipedon present? Yes: No: X
Redox Concentrations? Yes: X No: Colors: 10YR 3/3 & 7.5YR 3/4
Redox Depletions? Yes: X No: Color: 10YR 5/1
Matrix color: 2.5Y 3/1
Other hydric soil indicators: This site is located in a depressional area.
Hydric soils: Yes: X No:
Rationale: Site hydrology and the morphological characteristics of this soil suggest that the soils are saturated long enough for anaerobic conditions to occur in the upper profile for a significant duration. These conditions are demonstrated by the low chroma matrix and redox features. Therefore, these soils are hydric. This soil also meets the F3 and F6 hydric soil indicators from NRCS.

HYDROLOGY
Inundated: Yes: No: X Depth of standing water: None
Depth to saturated soil: More than 0.6 m (24 in)
Overview of hydrologic flow through system: Precipitation and sheet flow contribute water to this site. Most wetland hydrology results from changing water table levels, which are greatly affected by levels on the Mississippi River and the tributary streams in the area such as Bird Slough. Water leaves the site by evapotranspiration and groundwater recharge.
Size of watershed: More than 318,000 km^2 (120,000 mi^2) for the Mississippi River
Other field evidence observed: This site is an excavated depression in the floodplain of a large river. We observed some areas that lack vegetation and some algal mats, suggesting prolonged ponding.

ROUTINE ONSITE WETLAND DETERMINATION

Site 1 (page 2 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist — Date: 31 July 2002
Job No.: P96-037-73 — Project Name: FAP 319 (US 36)
State: Illinois — County: Pike — Applicant: IDOT District 6
Site name: Marsh
Legal Description: NE/4, Sec. 17, T.4S., R.8W.
Location: Excavated part of wetland restoration/creation site at East Hannibal

Wetland hydrology: Yes: X No:
Rationale: Landscape position and the evidence of prolonged ponding suggest that the site is inundated or saturated long enough during the growing season to meet the wetland hydrology criterion.

WETLAND DETERMINATION AND RATIONALE

Is the site a wetland? Yes: X No:
Rationale: This site meets all three wetland criteria. The site is not included in the NWI.

SPECIES LIST

Scientific name	Common name	Stratum	Wetland Indicator	C*
Acalypha rhomboidea	three-seeded mercury	herb	FACU	0
Acer negundo	box elder	shrub, herb	FACW-	1
Acer saccharinum	silver maple	shrub, herb	FACW	1
Achillea millefolium	yarrow	herb	FACU	**
Agalinis tenuifolia	slender false foxglove	herb	FACW	5
Alisma plantago-aquatica	water plantain	herb	OBL	2
Amaranthus tuberculatus	water hemp	herb	OBL	1
Ammania coccinea	scarlet loosestrife	herb	OBL	5
Ampelopsis cordata	raccoon grape	herb	FAC+	2
Andropogon virginicus	broomsedge	herb	FAC-	1
Apocynum sibiricum	prairie dogbane	herb	FAC+	2
Asclepias incarnata	swamp milkweed	herb	OBL	4
Aster pilosus	field aster	herb	FACU+	0
Aster praealtus	willow-leaved aster	herb	FACW	4
Aster simplex	panicled aster	herb	FACW	3
Betula nigra	river birch	shrub, herb	FACW	4
Bidens cernua	nodding bur-marigold	herb	OBL	2
Bidens frondosa	beggar's ticks	herb	FACW	1
Bidens tripartita	beggar's ticks	herb	FACW	2
Boehmeria cylindrica	false nettle	herb	OBL	3
Boltonia asteroides	false aster	herb	FACW	5
Bromus japonicus	Japanese brome	herb	FACU	**
Campsis radicans	trumpet creeper	shrub, herb	FAC	2
Carex annectens	sedge	herb	FACW	3
Carex frankii	sedge	herb	OBL	4
Carex laeviconica	sedge	herb	OBL	10
Carex lupulina	hop sedge	herb	OBL	5
Carex lurida	bottlebrush sedge	herb	OBL	7
Carex vulpinoidea	fox sedge	herb	OBL	3

* Coefficient of Conservatism (see introduction)
** Species not native to Illinois

(Species list continues on next page)

ROUTINE ONSITE WETLAND DETERMINATION

Site 1 (page 3 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
Date: 31 July 2002
Job No.: P96-037-73
Project Name: FAP 319 (US 36)
State: Illinois
County: Pike
Applicant: IDOT District 6
Site name: Marsh
Legal Description: NE/4, Sec. 17, T.4S., R.8W.
Location: Excavated part of wetland restoration/creation site at East Hannibal

SPECIES LIST (continued)

Scientific name	Common name	Stratum	Wetland Indicator	C*
Cassia fasciculata	partridge pea	herb	FACU-	1
Cassia marilandica	Maryland senna	herb	FACW	4
Catalpa speciosa	catalpa	shrub	FACU	0
Cercis canadensis	redbud	shrub	FACU	3
Cicuta maculata	water hemlock	herb	OBL	4
Cirsium discolor	field thistle	herb	UPL	3
Conyza canadensis	horseweed	herb	FAC-	0
Cornus drummondii	rough-leaved dogwood	shrub	FAC	2
Cyperus aristatus	flatsedge	herb	OBL	2
Cyperus esculentus	yellow nutsedge	herb	FACW	0
Cyperus strigosus	straw nutsedge	herb	FACW	0
Desmodium paniculatum	panicled tick trefoil	herb	FACU	2
Digitaria ischaemum	smooth crabgrass	herb	FACU	**
Digitaria sanguinalis	hairy crabgrass	herb	FACU	**
Diospyros virginiana	persimmon	shrub	FAC	2
Echinochloa muricata	barnyard grass	herb	OBL	0
Echinodorus berteroi	lance-leaved burhead	herb	OBL	6
Eclipta prostrata	yerba de tajo	herb	FACW	2
Eleocharis acicularis	spike rush	herb	OBL	3
Eleocharis compressa	flat-stemmed spike rush	herb	FACW	7
Eleocharis erythropoda	spike rush	herb	OBL	3
Eleocharis obtusa	spike rush	herb	OBL	2
Elymus virginicus	Virginia wild rye	herb	FACW-	4
Eragrostis spectabilis	purple love grass	herb	UPL	3
Erigeron annuus	daisy fleabane	herb	FAC-	1
Eupatorium serotinum	late boneset	herb	FAC+	1
Euphorbia maculata	nodding spruge	herb	FACU-	0
Euthamia graminifolia	grass-leaved goldenrod	herb	FACW-	3
Festuca pratensis	tall fescue	herb	FACU-	**
Fraxinus pennsylvanica	green ash	shrub, herb	FACW	2
Glyceria striata	fowl manna grass	herb	OBL	4
Gnaphalium obtusifolium	fragrant cudweed	herb	UPL	2
Helenium autumnale	sneezeweed	herb	FACW+	3
Ipomaea hederacea	ivy-leaved morning glory	herb	FAC	**
Ipomaea lacunosa	small morning glory	herb	FACW	1
Juncus acuminatus	rush	herb	OBL	4
Juncus effusus	soft rush	herb	OBL	4
Juncus tenuis	path rush	herb	FAC	0
Juncus torreyi	rush	herb	FACW	3

* Coefficient of Conservatism (see introduction)
** Species not native to Illinois

(Species list continues on next page)

ROUTINE ONSITE WETLAND DETERMINATION

Site 1 (page 4 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist — Date: 31 July 2002
Job No.: P96-037-73 — Project Name: FAP 319 (US 36)
State: Illinois — County: Pike — Applicant: IDOT District 6
Site name: Marsh
Legal Description: NE/4, Sec. 17, T.4S., R.8W.
Location: Excavated part of wetland restoration/creation site at East Hannibal

SPECIES LIST (continued)

Scientific name	Common name	Stratum	Wetland Indicator	C*
Lactuca biennis	biennial lettuce	herb	FAC	4
Lactuca serriola	prickly lettuce	herb	FAC	**
Leersia oryzoides	rice cutgrass	herb	OBL	3
Leptochloa fascicularis	sprangletop	herb	OBL	0
Lindernia dubia	false pimpernel	herb	OBL	5
Lobelia cardinalis	cardinal flower	herb	OBL	6
Lobelia siphilitica	great blue lobelia	herb	FACW+	4
Ludwigia alternifolia	seedbox	herb	OBL	5
Lycopus americanus	bugleweed	herb	OBL	3
Lysimachia ciliata	fringed loosestrife	herb	FACW	4
Lythrum alatum	winged loosestrife	herb	OBL	5
Melilotus alba	white sweet clover	herb	FACU	**
Mentha arvensis	field mint	herb	FACW	4
Mimulus alatus	monkey flower`	herb	OBL	6
Mimulus ringens	monkey flower	herb	OBL	5
Mollugo verticillata	carpetweed	herb	FAC	**
Monarda punctata	horsemint	herb	UPL	5
Panicum capillare	witchgrass	herb	FAC	0
Panicum dichotomiflorum	fall panic grass	herb	FACW-	0
Penthorum sedoides	ditch stonecrop	herb	OBL	2
Phalaris arundinacea	reed canary grass	herb	FACW+	**
Physostegia virginiana	obedient plant	herb	FACW	6
Plantago rugelii	Rugel's plantain	herb	FAC+	0
Poa pratensis	Kentucky bluegrass	herb	FAC-	**
Polygonum hydropiper	water pepper	herb	OBL	**
Polygonum hydropiperoides	mild water pepper	herb	OBL	4
Polygonum lapathifolium	nodding smartweed	herb	FACW+	0
Polygonum pensylvanicum	smooth smartweed	herb	FACW+	1
Polygonum persicaria	lady's-thumb	herb	FACW	**
Polygonum punctatum	dotted smartweed	herb	OBL	3
Polygonum scandens	climbing knotweed	herb	FAC	2
Populus deltoides	cottonwood	shrub, herb	FAC+	2
Potentilla norvegica	rough cinquefoil	herb	FAC	0
Pycnanthemum tenuifolium	slender mountain mint	herb	FAC	4
Pyrrhopappus carolinianus	false dandelion	herb	UPL	1
Quercus palustris	pin oak	shrub, herb	FACW	4
Rorippa islandica	yellow marsh cress	herb	OBL	4
Rosa multiflora	multiflora rose	shrub	FACU	**
Rosa setigera	Illinois rose	shrub	FACU+	5
Rumex crispus	curly dock	herb	FAC+	**

* Coefficient of Conservatism (see introduction)
** Species not native to Illinois

(Species list concludes on next page)

ROUTINE ONSITE WETLAND DETERMINATION

Site 1 (page 5 of 5)

Field Investigators: Tessene, Wilm, Kurylo, and Feist
Date: 31 July 2002
Job No.: P96-037-73
Project Name: FAP 319 (US 36)
State: Illinois
County: Pike
Applicant: IDOT District 6
Site name: Marsh
Legal Description: NE/4, Sec. 17, T.4S., R.8W.
Location: Excavated part of wetland restoration/creation site at East Hannibal

SPECIES LIST (concluded)

Scientific name	Common name	Stratum	Wetland Indicator	C*
Sagittaria latifolia	common arrowhead	herb	OBL	4
Salix amygdaloides	peach-leaved willow	shrub	FACW	4
Salix exigua	sandbar willow	shrub	OBL	1
Salix nigra	black willow	shrub, herb	OBL	3
Scirpus atrovirens	green bulrush	herb	OBL	4
Scirpus pendulus	red bulrush	herb	OBL	3
Setaria faberi	giant foxtail	herb	FACU+	**
Setaria glauca	yellow foxtail	herb	FAC	**
Sida spinosa	prickly mallow	herb	FACU	**
Solanum caroliniense	horse nettle	herb	FACU-	0
Solidago canadense	Canada goldenrod	herb	FACU	1
Sparganium eurycarpum	common bur reed	herb	OBL	5
Stachys tenuifolia	hedge nettle	herb	FACW+	5
Taraxacum officinale	dandelion	herb	FACU	**
Toxicodendron radicans	poison ivy	herb	FAC+	1
Tridens flavus	purpletop	herb	UPL	1
Trifolium pratense	red clover	herb	FACU+	**
Trifolium repens	white clover	herb	FACU+	**
Typha angustifolia	narrowleaf cattail	herb	OBL	**
Typha latifolia	common cattail	herb	OBL	1
Ulmus americana	American elm	shrub, herb	FACW-	5
Ulmus pumila	Siberian elm	shrub	UPL	**
Verbena hastata	blue vervain	herb	FACW+	3
Verbena urticifolia	white vervain	herb	FAC+	3
Vitis riparia	riverbank grape	herb	FACW-	2
Xanthium strumarium	cocklebur	herb	FAC	0

* Coefficient of Conservatism (see introduction)
** Species not native to Illinois

Mean c value = $\Sigma C/N = 306/111 = 2.8$

$FQI = \overline{C}\sqrt{N} = \Sigma C/\sqrt{N} = 306/\sqrt{111} = 29.0$

Including planted tree species (unplanted individuals of *Fraxinus* and *Quercus palustris* are present on the site):

Carya illinoensis	pecan	sapling, shrub	FACW	6
Quercus bicolor	swamp white oak	sapling	FACW+	7

Mean c value = $\Sigma C/N = 319/113 = 2.8$

$FQI = \overline{C}\sqrt{N} = \Sigma C/\sqrt{N} = 319/\sqrt{113} = 30.0$

Determined by: Paul Tessene, Brian Wilm, and Mary Ann Feist (vegetation and hydrology)
Jesse Kurylo (soils and hydrology)
Illinois Natural History Survey
Center for Wildlife Ecology
607 East Peabody Drive
Champaign, Illinois 61820
(217) 244-7984, 244-2176, 244-2110, 244-0692

Appendix 2
Plant species observed in pre-existing wet meadow at East Hannibal wetland compensation site, August 2002

Scientific name	Common name	Stratum	Wetland Indicator	C*
Acer saccharinum	silver maple	shrub, herb	FACW	1
Alisma plantago-aquatica	water plantain	herb	OBL	2
Apocynum sibiricum	prairie dogbane	herb	FAC+	2
Asclepias incarnata	swamp milkweed	herb	OBL	4
Aster simplex	panicled aster	herb	FACW	3
Bidens frondosa	beggar's ticks	herb	FACW	1
Boehmeria cylindrica	false nettle	herb	OBL	3
Campsis radicans	trumpet creeper	shrub, herb	FAC	2
Carex frankii	sedge	herb	OBL	4
Carex lupulina	hop sedge	herb	OBL	5
Carex vulpinoidea	fox sedge	herb	OBL	3
Carex sp.	sedge	herb	–	–
Cephalanthus occidentalis	buttonbush	shrub	OBL	4
Cuscuta sp.	dodder	herb	–	–
Cyperus esculentus	yellow nutsedge	herb	FACW	0
Echinochloa muricata	barnyard grass	herb	OBL	0
Epilobium coloratum	cinnamon willow-herb	herb	OBL	3
Erechtites hieracifolia	fireweed	herb	FACU	2
Eupatorium serotinum	late boneset	herb	FAC+	1
Fraxinus pennsylvanica	green ash	shrub	FACW	2
Hypericum mutilum	dwarf St. John's wort	herb	FACW	5
Ipomoea lacunosa	small morning glory	herb	FACW	1
Juncus interior	rush	herb	FAC+	3
Leersia oryzoides	rice cutgrass	herb	OBL	3
Lobelia siphilitica	great blue lobelia	herb	FACW+	4
Ludwigia palustris	marsh purslane	herb	OBL	4
Lycopus americanus	bugleweed	herb	OBL	3
Lythrum alatum	winged loosestrife	herb	OBL	5
Mimulus ringens	monkey flower	herb	OBL	5
Penthorum sedoides	ditch stonecrop	herb	OBL	2
Phalaris arundinacea	reed canary grass	herb	FACW+	**
Poa pratensis	Kentucky bluegrass	herb	FAC-	**
Polygonum amphibium	water smartweed	herb	OBL	3
Polygonum lapathifolium	nodding smartweed	herb	FACW+	0
Polygonum pensylvanicum	smooth smartweed	herb	FACW+	1
Populus deltoides	cottonwood	shrub	FAC+	2
Sagittaria latifolia	common arrowhead	herb	OBL	4
Salix amygdaloides	peachleaf willow	shrub	FACW	4
Salix exigua	sandbar willow	shrub	OBL	1
Salix nigra	black willow	sapling, shrub	OBL	3
Scirpus atrovirens	green bulrush	herb	OBL	4
Scirpus validus	soft-stemmed bulrush	herb	OBL	4
Typha latifolia	common cattail	herb	OBL	1
Ulmus americana	American elm	shrub	FACW-	5
Vitis riparia	riverbank grape	woody vine, herb	FACW-	2

* Coefficient of Conservatism (see introduction)
Mean c value = $\sum C/N = 110/41 = 2.7$

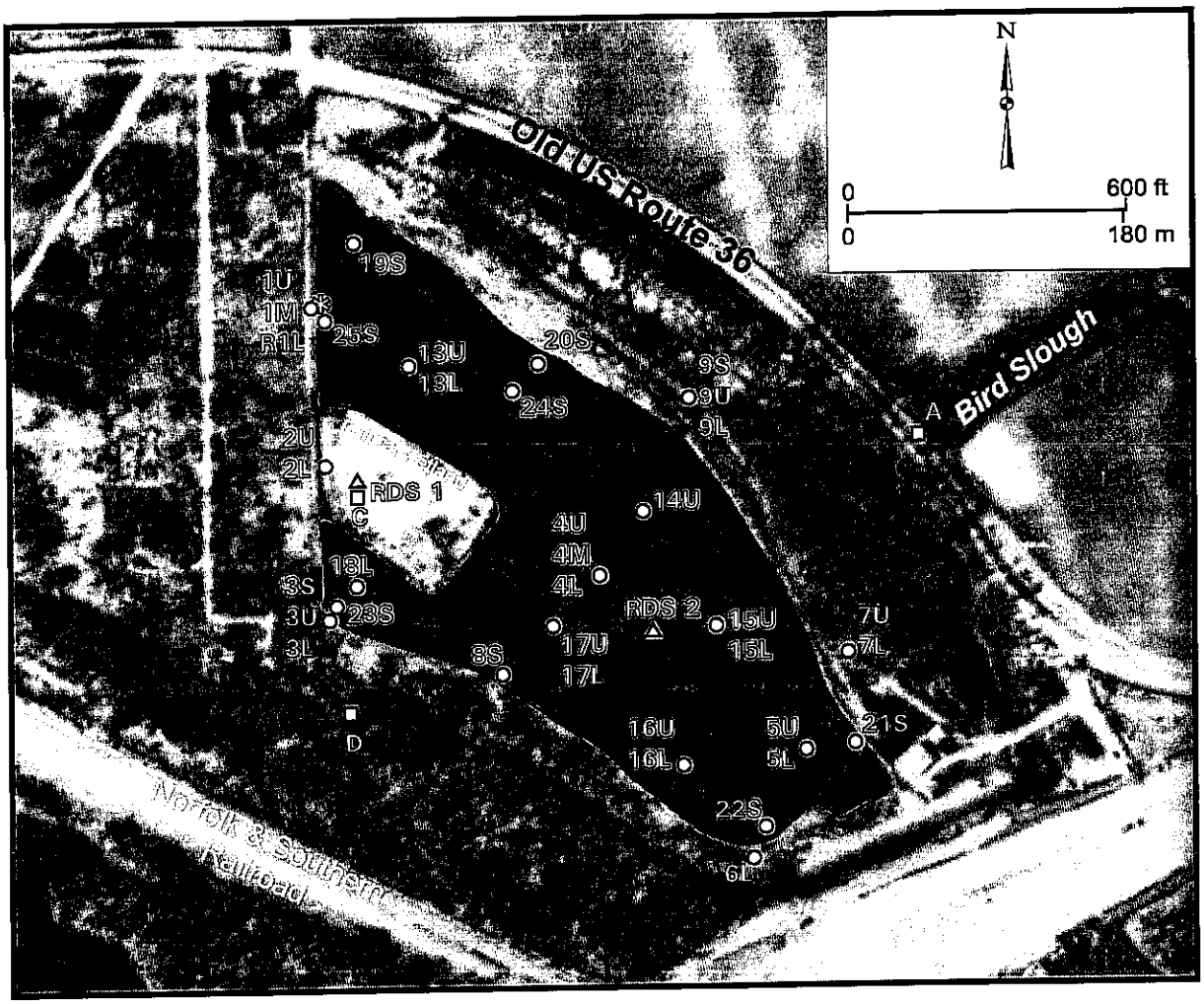
** Species not native to Illinois
$FQI = \bar{C}\sqrt{N} = (2.7)\sqrt{41} = 17.2$

Hannibal Bridge Wetland Compensation Site

(FAP 319)

Estimated Areal Extent of 2002 Wetland Hydrology

map based on USGS digital orthophotograph Hannibal East, NW quarter quadrangle
produced from 4/12/99 aerial photography (ISGS 2002)



estimated areal extent of 2001 wetland hydrology within excavated area

- monitoring well
- stage gauge
- RDS data logger
- rain gauge

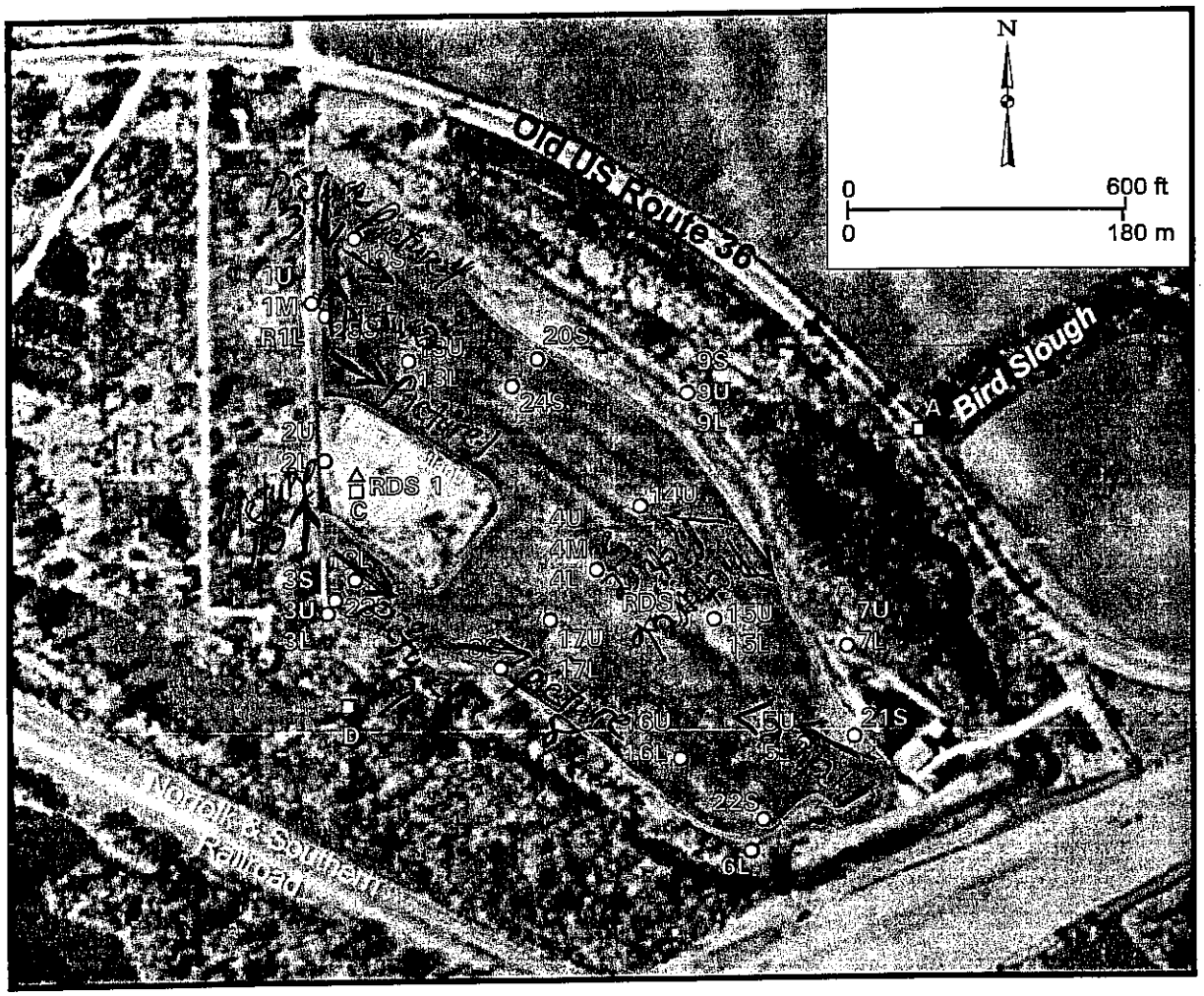
Location of photo stations.

Hannibal Bridge Wetland Compensation Site

(FAP 319)

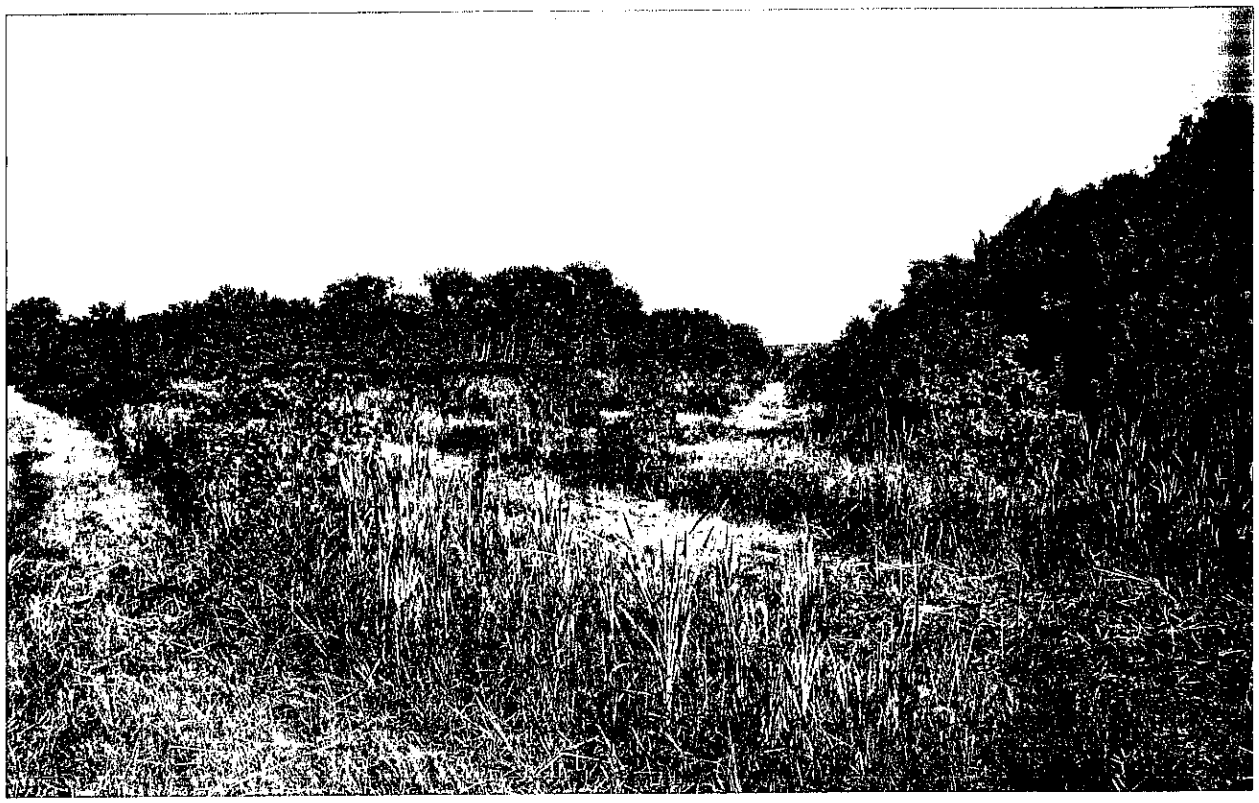
Estimated Areal Extent of 2002 Wetland Hydrology

map based on USGS digital orthophotograph Hannibal East, NW quarter quadrangle
produced from 4/12/99 aerial photography (ISGS 2002)

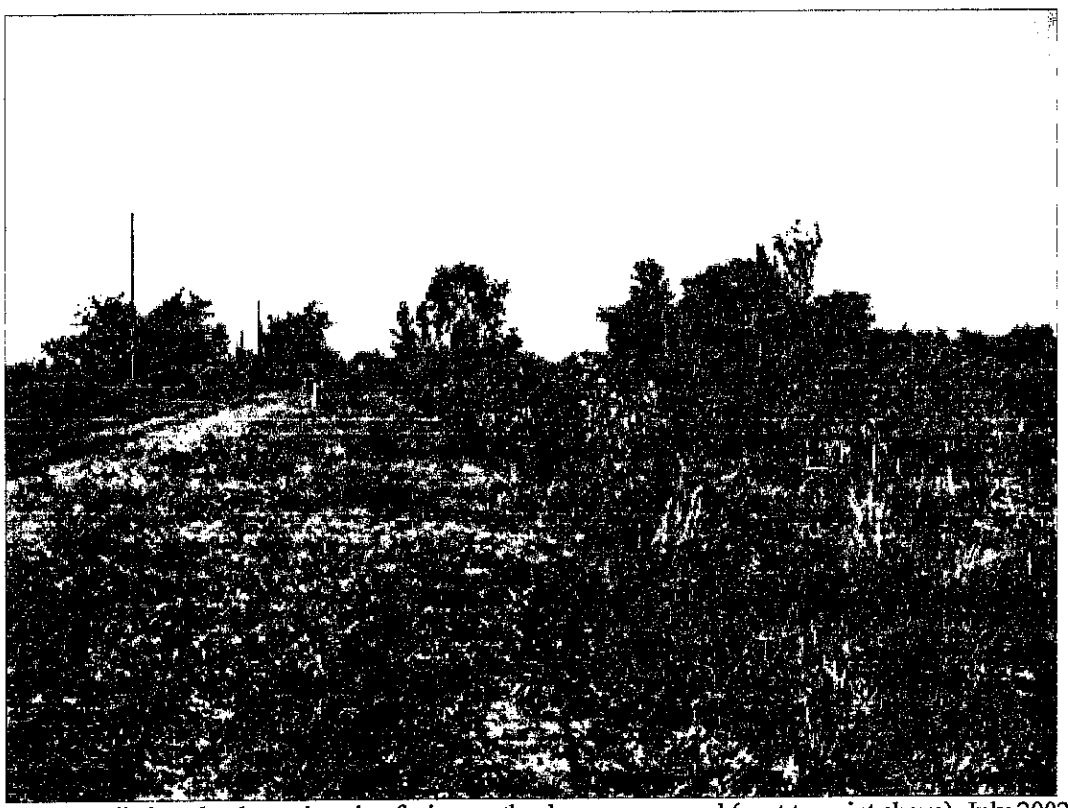


estimated areal extent of 2001 wetland hydrology within excavated area

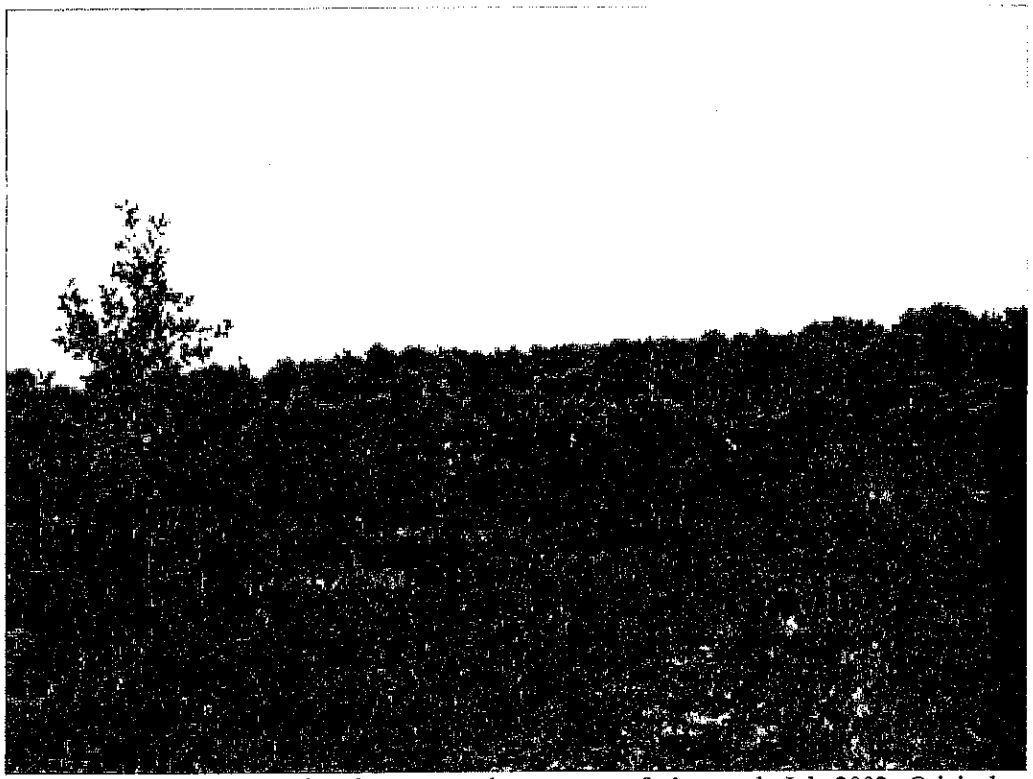
- ○ monitoring well
- □ stage gauge
- △ RDS data logger
- ❄ rain gauge



East Hannibal wetland creation site, facing east, from access road, July 2002. Note mowing between rows of planted trees. Original wet meadow, now overgrown with woody plants, on right.

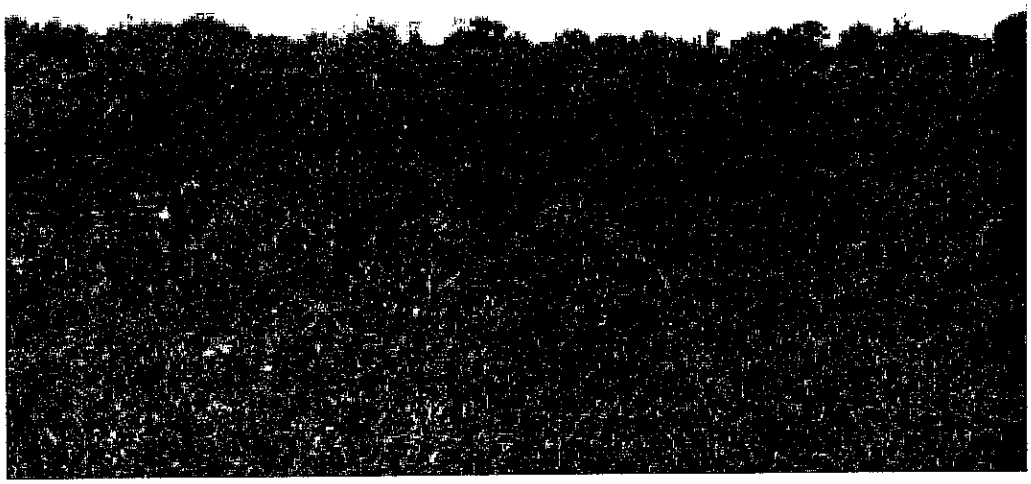


East Hannibal wetland creation site, facing north, along access road (next to point above), July 2002.



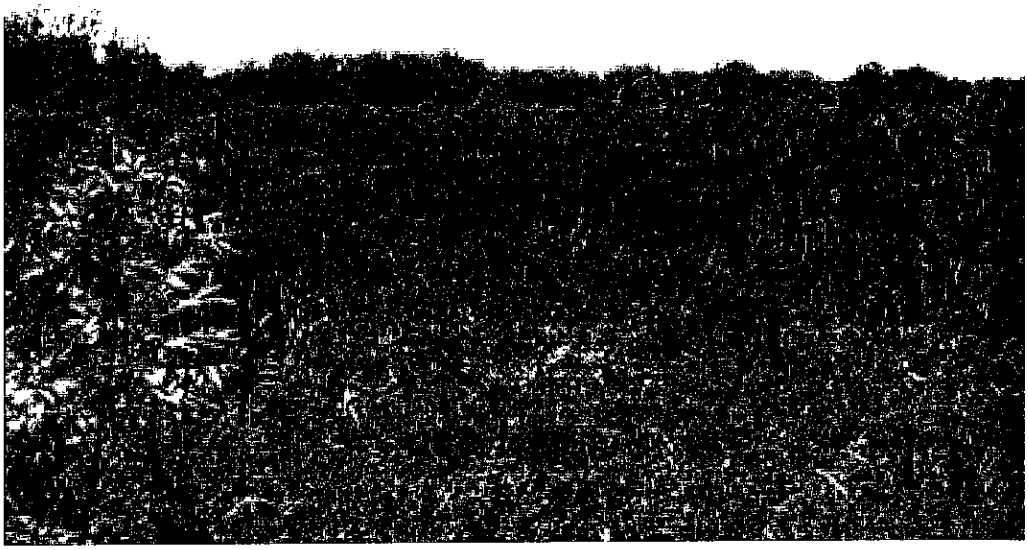
East Hannibal wetland creation site, near northwest corner, facing south, July 2002. Original wet meadow, now overgrown with woody plants, in background.

East Hannibal wetland creation site, near northwest corner, facing east, July 2002. Note planted trees.



East Hannibal wetland creation site, near middle of north side, facing west, July 2002.

East Hannibal wetland creation site, near middle of north side, facing east-southeast, July 2002.



East Hannibal wetland creation site, near east end, facing west. July 2002.

East Hannibal wetland creation site, near middle of south side, facing east, July 2002.

East Hannibal wetland creation site, west end, just south of pre-existing wet meadow, now overgrown with woody plants (upper left of image). This part of the wetland creation site was low, wet, and dense with cattails. July 2002.

East Hannibal wetland creation site, near southwest corner, facing north along access road. Note pre-existing wet meadow now overgrown with woody plants. July 2002.